



Technology Inclusive Content of Application Project Workshop

May 26, 2021
Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 389 389 221#

Agenda

Time	Topic*	Speaker
10:00 - 10:15 am	Opening Remarks	NRC/Southern
10:15 - 12:00 am	First Workshop Session Topics. The topic# is based on the list of topics found in a document available in ADAMS at Accession No. ML21120A057 Topic #17 - Definition of Licensing Basis Topic #18 - Proposed FSAR Chapter 1 – not licensing basis info Topic #3b, 10, 12 - Defense in Depth	NRC/Southern
12:00 - 1:00 pm	Break	All
1:00 -2:45 pm	Second Workshop Session Topics Topic #9 - Reliability and Other Targets Topic #6 - Principal Design Criteria (PDC)	NRC/Southern
2:45 - 3:30 pm	BREAK	All
3:30 - 5:15 pm	Third Workshop Session Topics Topic #7 - 10 CFR 50.43(e) Testing Topic #22 – Additional topics from eVinci and MCRE Tabletop Exercises Topic #20 – TICAP RG and ARCAP ISG	NRC/Southern
5:15 - 5:30 pm	Plans for Future Discussions	NRC/Southern
5:30 - 6:00 pm	Stakeholder Comments/Questions	All

***Note that the list of topics to be discussed during the allotted time slot is subject to change. Additional detail regarding the list of topics can be found at ADAMS Accession No. ML21120A057**

TICAP Workshop

- The purpose of this workshop is to discuss with the nuclear industry issues related to the draft guidance document for Safety Analysis Report (SAR) content for an advanced reactor application based on the licensing modernization project
- Key documents associated with the workshop are referenced in the meeting notice and include:
 - Industry-developed draft TICAP guidance document ([ADAMS Accession No. ML21106A013](#))
 - Potential Issues to be Discussed During TICAP Workshops ([ADAMS Accession No. ML21120A057](#))
 - As updated by May 11, 2021, Meeting Summary Enclosure 2 ([ADAMS Accession No. ML21132A295](#))
- Additional Background Available on NRC ARCAP/TICAP public webpage (see: <https://www.nrc.gov/reactors/new-reactors/advanced/details.html#advRxContentAppProj>)

ARCAP and TICAP – Nexus

Outline Safety Analysis Report (SAR) – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview of the Safety Case
2. Generic Analyses
3. Licensing Basis Event (LBE) Analysis
4. Integrated Plant Analysis
5. Safety Functions, Design Criteria, and SSC Categorization
6. Safety Related SSC Criteria and Capabilities
7. Non-safety related with special treatment SSC Criteria and Capabilities
8. Plant Programs

Additional SAR Content –Outside the Scope of TICAP

9. Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste
10. Control of Occupational Doses
11. Organization
12. Initial Startup Programs

- Safety Analysis Report (SAR) structure based on clean sheet approach



Audit/inspection of Applicant Records

- Calculations
- Analyses
- P&IDs
- System Descriptions
- Design Drawings
- Design Specs
- Procurement Specs

Additional Portions of Application

- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- PRA
- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Physical Security Plan
- SNM physical protection program
- SNM material control and accounting plan
- Cyber Security Plan
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Inservice inspection/Inservice testing (ISI/IST) Program
- Environmental Report
- Site Redress Plan
- Exemptions, Departures, and Variances
- Facility Safety Program (under consideration for Part 53 applications)

Discussion Slides

Technology Inclusive Content of Application Project (TICAP)

Workshop #3
May 26, 2021

Brandon Chisholm, Southern Company
Alan Levin, Consultant
Steve Nesbit, LMNT Consulting
Steve Schilthelm, BWXT
Ed Wallace, GNBC Associates



Southern
Company



- The TICAP Team appreciates the preliminary comments from the Nuclear Regulatory Commission (NRC) and Idaho National Laboratory (INL)
- These slides are intended to support a dialog on initial NRC comments on the draft TICAP guidance document and do not represent final regulatory positions
- Workshop #3 Discussion Topics are addressed in the following order (those revisited from previous workshops are in red)

17 18 3b/10/12 9 6 7 22 20

- The words on the following slides in italics are the NRC topics and, in some cases, the associated NRC comments

Topic 17 – Licensing Basis



- *The TICAP guidance document refers to “licensing basis”, however, there is a definition of “current licensing basis” contained in 10 CFR 54.3 which was necessitated by license renewal. Should a reference to that definition be included in the guidance or should that definition be revisited and redefined for the purposes of use of the LMP approach or for inclusion in Part 53 for that matter. Question for discussion is whether or not the definition needs to be modified for the purposes of this guidance document or other advanced reactor guidance documents?*
- TICAP Discussion
 - The definition of current licensing basis in 10 CFR 54.3 is as intended in TICAP guidance
 - TICAP does not see a need to add the reference but is open to discussing the point

Topic 18 – Chapter 1 and Change Process



- *There should be alignment on the proposal to not include licensing basis information in Chapter 1. The purpose, I think, is to also exclude Chapter 1 for the change process and reduce future regulatory burden. However, our current concept of the change process is 10 CFR 50.59 and it is not clear as to what the change process under Part 53 might be.*
- TICAP Discussion
 - TICAP believes the question is focused on the change process (not specifically addressed in TICAP) and there is general alignment that Chapter 1 is not part of the licensing basis
 - Chapter 1 contains two types of information that provide an overview and establish context for reviewers and stakeholders
 - » Summary information from TICAP Chapters 2-8
 - » Other contextual information regarding parts of the plant not included in the LMP-based affirmative safety case

Topic 18 – Chapter 1 and Change Process (cont.)



- Chapter 1 would not be “excluded” from the change process (50.59 today or Part 53 in the future)
- Changes would be either:
 - » Driven by the need to be consistent with changes to Chapters 2-8 where appropriate evaluations, approvals, and updates have been executed
 - » Contextual information easily screened – included in periodic FSAR updates

Topic 3b, 10,12 – Defense in Depth (DID)



- This discussion focuses on the supplemental DID guidance comments from NRC dated May 17, 2021
 - *TICAP guidance document Section 4.2 addresses defense-in-depth (DID). It is unclear from the guidance that an adequate level of detail would be included in the SAR regarding the evaluation of DID.*
- TICAP Discussion
 - Comments are very constructive
 - Additional focus on risk-significant events is an important “safety focus” for DID guidance
 - Each of the seven comments requires clarification and/or further discussion
 - Several of the comments provide language suggestions that overlap for section 4.2 and differ in some ways
 - » Resolving the specific comments is a prerequisite for revising the introductory language in the guidance
 - » This will be done as part of Revision 0 finalization

Topic 3b, 10,12 – DID (cont.)

Comment 1



- *Add the following to Section 4.2: “Baseline Evaluation of Defense in Depth*

This section should describe the “baseline” level of defense in depth provided by the proposed facility. This baseline is established when the recurring evaluation of plant capability and programmatic capability associated with design and PRA update cycles no longer identifies risk-significant vulnerabilities where potential compensatory actions can make a practical, significant improvement to the LBE risk profiles or risk-significant reductions in the level of uncertainty in characterizing the LBE frequencies and consequences. This baseline DID evaluation and its outcome are to be documented in sufficient detail to assure that future changes to physical, functional, operational, or programmatic features of the facility can be effectively evaluated for their potential for reduction of DID before proceeding.”

Topic 3b, 10,12 – DID (cont.)

Comment 1



- TICAP Discussion
 - TICAP agrees with adding wording from #1 above with the following clarifications:
 - »Ch 4 DID content focuses on the Integrated DID Baseline results only
 - Also see discussion on Comments 2, 3, 4, 5, 6
 - »Additional guidance beyond NEI 18-04 to flesh out the DID baseline guidance further in the TICAP Guidance may be appropriate
 - Further discussion on the level of guidance detail would result from reconciliation of the remaining comments
 - »Additional changes to the TICAP guidance document will be provided in Revision 0 (July 2021)

Topic 3b, 10,12 – DID (cont.)

Comment 2



- Section 4.2.1 describes SAR content guidance for plant capability DID evaluations. Suggest the following changes to Section 4.2.1:

“The purpose of this section is to provide a description of the SSCs and the layers of defense they represent in the overall achievement of an acceptable level of DID. The application should describe how the design meets the guidelines for plant capability attributes provided in NEI 18-04 Table 5-2 [“Guidelines for Establishing the Adequacy of Overall Plant Capability Defense-in-Depth”]. Separate discussions of plant capabilities that are relied upon to meet these plant capability attributes should be provided in this section. For example, describe how the design minimizes the frequency of challenges to safety-related SSCs including controlling abnormal operation, detecting failures and preventing design basis accidents.”

Topic 3b, 10,12 – DID (cont.)

Comment 2



- TICAP Discussion

- #2.1 - TICAP agrees with clarifying the introductory language to Section 4.2.1 with the following understanding:

- » Plant capabilities are primarily described in Chapters 3, 5, 6, 7 including some of the topics in NEI 18-04 Table 5-2

- The DID integrated evaluation in Ch 4 is therefore focused on addressing cross-cutting topics including layers of defense, single features, and risk-significant uncertainties for those events that are managed through programmatic actions

- » Conforming narrative text may be added as necessary to address risk significant events with respect to Layers of Defense or other plant capability attributes not addressed in Chapters 3, 5, 6 or 7

Topic 3b, 10,12 – DID (cont.)

Comment 2



- #2.2 - “... describe how the design minimizes the frequency of challenges...”
 - »TICAP does not agree with the example sentence
 - »Minimization is not the objective of TICAP or LMP.
 - »Adequate protection is the objective for plant capability
 - The evaluation of layers of defense illuminates the ways that progression of events from the initial response to the ultimate protection actions
 - »The deliberations that are part of the Integrated Decision-Making Process (IDP) are contained in the design records
 - Also see discussion of Comment 6

Topic 3b, 10,12 – DID (cont.)

Comment 3



- *Modify TICAP text in Section 4.2.1.2 as follows:*

“This section should describe how the design addresses each qualitative guideline in NEI 18-04 Table 5-2 for each LBE and describe any departures from the stated criteria. The applicant should provide a summary identification of the layers of defense for each risk-significant LBE and describe the extent of independence between different LBE layers of defense. The applicant should describe for each risk-significant LBE how the design does not have an over reliance on a single design feature, barrier, or operational feature relied upon to meet quantitative objectives. The criteria used to decide whether or not an over reliance exists should be provided. The application should describe how the process identifies the potential for common cause failures and how those vulnerabilities were eliminated. Describe how the design provides an appropriate balance between event prevention and mitigation in the layers of defense for risk-significant LBEs. The criteria used to decide whether or not there is an appropriate balance between prevention and mitigation should be provided.”

Topic 3b, 10,12 – DID (cont.)

Comment 3



- TICAP Discussion

- #3.1 – This section is focused on Layers of Defense evaluations
 - » Other aspects of the DID adequacy evaluation are contained in other chapters or sections
- #3.2 – “... over reliance on a single design feature...”
 - » As a single feature may participate in more than one licensing basis event (LBE), Chapter 4 would be place to provide the discussion on
 - Why it is required
 - Any other plant capability to mitigate its failure
 - What special treatments are provided for DID purposes
 - » As noted in the introduction to Section 4.2, there is no requirement to describe negative findings or not-applicable considerations in the SAR

Topic 3b, 10,12 – DID (cont.)

Comment 3



- TICAP Discussion

- #3.3 – “...*The criteria used to decide whether or not an over reliance exists should be provided.*”
 - » This is an open-ended requirement that depends on the design-specific safety case, the design control procedures, externalities such as emergency planning zone size objectives, etc.
 - » Putting this result in the SAR guidance could create a burden and the outcome remains potentially subjective
 - » The LMP methodology provides sufficient process guidance that should not also be repeated in the TICAP guidance
 - » This supporting information will be in design records

Topic 3b, 10,12 – DID (cont.)

Comment 3



- TICAP Discussion

- #3.4 - *“...describe how the process identifies the potential for common cause failures and how those vulnerabilities were eliminated.”*

- » This is a level of detail that is in the design records for the PRA input documents such as failure modes and effects analyses

- » Analysis of common cause failures is part of the PRA

- #3.5 - The discussion of prevention vs mitigation balance needs further discussion with NRC

- » The DID Paper supporting NEI 18-04 provides a different perspective on prevention-mitigation

- » Multiple Layers of Defense is the selected means to evaluate this

- » A framework for evaluating prevention and mitigation across layers of defense is provided in NEI 18-04 Section 5.7 (including Table 5-4)

Topic 3b, 10,12 – DID (cont.)

Comment 4



- Add new text to section 4.2.1.2 as follows:

“For SSCs that perform prevention and mitigation functions for risk-significant LBEs, describe the set of requirements related to the performance, reliability, and availability of the SSC functions that are relied upon to ensure the accomplishment of their tasks, as defined by the PRA or deterministic analysis. This section should also describe the capability of those SSCs relied upon for DID. This should include how that capability is ensured through testing, maintenance, inspection and performance monitoring. If this information is provided in other sections it need not be repeated here.”
- TICAP Discussion
 - #4.1 - *“For SSCs that perform prevention and mitigation functions...”*
See comment in #3.5 above.

Topic 3b, 10,12 – DID (cont.)

Comment 4



- #4.2 - “...functions for risk-significant LBEs, describe the set of requirements related to the performance, reliability, and availability...”
 - » This comment is referred to Topic 9
- #4.3 – “testing, maintenance, inspection and performance monitoring”
 - » Special treatment requirements related to a part of the DID evaluation are categorically identified in Chapters 6 and 7

Topic 3b, 10,12 – DID (cont.)

Comment 5



- Section 4.2.2 describes SAR content guidance for programmatic DID evaluations. Suggest modifying the text in Section 4.2.2 as follows:

“Programmatic DID should be used to address uncertainties when evaluating plant capability DID as well as uncertainties in programmatic measures. It should provide the basis for defining special treatment requirements to ensure there is reasonable assurance that the predicted performance of SSCs and programmatic measures can be achieved throughout the life of the plant. The application should describe how the design incorporates the programmatic capability attributes provided in NEI 18-04 Table 5-6 to provide adequate assurance that the risk, reliability, and performance targets will be met and maintained throughout the life of the plant with adequate consideration of sources of significant uncertainties. This description should support the discussion of special treatment programs selected for safety-significant SSCs described in Chapters 6 and 7. Special treatments described in NEI 18-04 Table 5-7 should be considered, although the application does not need to address items that are not applicable. The application should describe how uncertainty in programmatic DID is addressed and how additional measures are in place to address unknowns.”

Topic 3b, 10,12 – DID (cont.)

Comment 5



- TICAP Discussion
 - #5.1 – The added language is generally acceptable however, most of the information in the SAR on Plant Capability is provided in Chapters 3, 5, 6 and 7
 - » Is this intended as part of the introduction to 4.2.2?
 - » As noted in Comment #2.1, conforming subsections for some DID evaluation topics appropriate to Chapter 4 focus will be added to the guideline
 - #5.2 – What is meant by “...*uncertainties in programmatic measures.*”?
 - #5.3 - In the last line of this comment, there is reference to “...*how additional measures are in place to address unknowns.*”
 - » Further discussion requested

Topic 3b, 10,12 – DID (cont.)

Comment 6



- *Add a requirement to summarize the integrated decision-making process (IDP) which NEI 18-04 emphasizes (in Section 5.6) as “responsible for making the deliberate, affirmative decision that DID adequacy has been achieved”. Suggest the following be added to the TICAP guidance document:*

“The application should summarize how the IDP process was applied in evaluating the overall adequacy of DID. The description should address how each of the decision guidelines listed in NEI 18-04, Section 5.9.3, was evaluated and the basis for an affirmative response. The criteria used in making the decisions (e.g., risk margins are sufficient, prevention/mitigation balance is sufficient, etc.) should be provided. If quantitative measures were used as part of the criteria, they should be provided. A description of how the results of the IDP process are documented and available for future DID decision-making and operations support should also be provided.”

Topic 3b, 10,12 – DID (cont.)

Comment 6



- TICAP Discussion

- #6.1 - As noted in response to Topic #10 in Workshop 1, the DID integrated results are the focus of Chapter 4
- #6.2 - “...summarize how the IDP process was applied...”.
 - » Results of the IDP should be limited to results that are part of the DID Baseline
 - » Specific actions to supplement programmatic special treatments not identified in Chapter 5 based on DID evaluations of LBE margin and uncertainties or other factors should be reflected in Chapter 4
 - » The remainder of the considerations should be documented in design records or programmatic control procedures and program basis documents that would be available for audit and inspection

Topic 3b, 10,12 – DID (cont.)

Comment 7



- Add the following to the end of section 4.2:

“Evaluation and Incorporation of Changes to Defense in Depth

The change control process should be described addressing how the baseline DID evaluation will be re-evaluated, based on proposed changes, to determine which programmatic or plant capability attributes have been affected for each layer of defense. Changes that impact the definition and evaluation of LBEs, safety classification of SSCs, or risk significance of LBEs or SSCs must be assessed. This section should also describe how any changes to the baseline DID evaluation will be documented and implemented.”

Topic 3b, 10,12 – DID (cont.)

Comment 7



- TICAP Discussion
 - #7.1- The general issue of design basis and licensing basis change control is part of the designer or operator design and configuration management programs and their compliance with the then current regulatory administrative control requirements
 - This is outside of TICAP scope

Topic 9 – Reliability and Capability Targets



- Current draft guidance does not specify including SSC reliability and capability targets in the Safety Analysis Report (SAR)
- NRC wants to see the targets included
 - NEI 18-04 p. 38 states the targets should be included in the SAR
- TICAP acknowledges the need to be consistent with the guidance in NEI 18-04
 - Internal discussions are underway to reconcile differing viewpoints on the optimal manner of documentation
 - TICAP is not ready to advance proposals to the NRC today
- TICAP proposes supplemental focused discussions with NRC in mid-late June on this issue

Topic 6 – Principal Design Criteria (PDC)



- *The guidance for inclusion of principal design criteria (PDC) may be incomplete, since only "LMP outcomes" are addressed, and other topics from Part 50 App. A (like Monitoring Fuel & Waste Storage) are not clearly included for consideration*
 - NRC believes the TICAP approach to establishing the RFDC as the PDC is too narrow.
 - TICAP does not believe the intent of NEI 18-04 was to impose deterministic PDC on a risk-informed, performance-based process
- Aspects for consideration include:
 - Cross-cutting GDC/ARDC;
 - Areas outside TICAP scope such as releases during normal operation (GDC 60); and
 - Implications of GDC imposing requirements beyond those that might be established by LMP (e.g., GDC 17 and single failure).

Topic 6 – Principal Design Criteria (PDC), cont.



- TICAP Discussion
 - The GDC were written to address large light water reactor (LWR) design considerations
 - The GDC were neither risk-informed nor performance-based (RIPB) in the light of current definitions or policy objectives
 - The Advanced Reactor Design Criteria (ARDC) were developed in the mold of the GDC for non-LWR designs (they were not RIPB either)
 - Imposing deterministic design criteria on a RIPB process is problematical
 - The GDC/ARDC content may not address unique safety requirements or features associated with non-LWRs or with plants with widely variant sizes and/or design approaches
 - The GDC/ARDC content contains prescriptions that include features (like redundancy and diversity) to achieve needed reliability for active safety systems, but do not directly address inherent or passive plant capability

Topic 6 – Principal Design Criteria (PDC), cont.



- TICAP Discussion
 - The LMP approach to develop PDC is a structured approach built upon satisfaction of fundamental safety functions as applied to specific design types (and sizes)
 - The use of the LMP approach provides an acceptable alternative to identify risk-significant and other safety significant functional requirements that can then be satisfied by design-specific SSC capabilities
 - This approach provides alternative results to the use of the term “important to safety,” which has a less precise and consistent use in past practice
 - The use of the RIPB approach provides an acceptable alternative to single failure criteria

Topic 6 – Principal Design Criteria (PDC), cont.



- TICAP Discussion
 - TICAP sees this issue as administrative/regulatory in nature, not technical
 - We seek the NRC's assistance in identifying the most efficient approach to dealing with it

Topic 6 – Principal Design Criteria (PDC), cont.



Category of design criteria	TICAP discussion	Suggested path forward
Prescriptive functional GDC/ARDC that impose requirements beyond those that might be established by LMP (e.g., GDC 17 and single failure)	Based on the proper implementation of the LMP approach, RIPB requirements that satisfy the intent of these GDC/ARDC will be identified and presented in the SAR	No further actions (e.g., modification to the TICAP guidance) are required to ensure that these PDC will be identified and presented appropriately
Cross cutting GDC/ARDC (e.g., GDC/ARDC 1-4)	Based on the proper implementation of the LMP approach, RIPB elements will be developed by a designer and presented in the corresponding portion of a SAR developed using the TICAP guidance	<i>Further clarification of the difference between these requirements and the PDC (as defined by TICAP) may be a useful modification to the TICAP guidance</i>

Topic 6 – Principal Design Criteria (PDC), cont.



Category of design criteria	TICAP discussion	Suggested path forward
GDC/ARDC outside of TICAP scope (such as releases during normal operation, GDC 60)	There is a gap between these GDC/ARDC and the design criteria and/or requirements that would be identified via proper implementation of the LMP process	<i>Since these GDC/ARDC are outside of the scope of TICAP, perhaps NRC could develop guidance (as part of ARCAP) that would indicate how these design criteria (related to normal operation) should be identified and presented in a non-LWR licensing application</i>

Topic 6 – Principal Design Criteria (PDC), cont.



Category of design criteria	TICAP discussion	Suggested path forward
Design criteria and/or requirements that are applicable to a given technology/design that are not included in the GDC/ARDC	Proper use of the LMP approach will identify such criteria and they will be presented appropriately (i.e., as PDC, CDC, Special Treatments, etc.) within a SAR developed using the TICAP guidance.	No further actions (e.g., modification to the TICAP guidance) are required to ensure that these requirements will be identified and presented appropriately
GDC/ARDC that are applicable mostly or completely as written to a specific technology/design	Based on the proper implementation of the LMP approach, RIPB requirements that satisfy the intent of these GDC/ARDC will be identified and presented in a SAR developed using the TICAP guidance.	Shown here for completeness; no further actions are required

Topic 6 – Principal Design Criteria (PDC), cont.



Aspect of Safety Case	LMP/TICAP	GDC/ARDC
Adequate protection of the health and safety of the public	PDC (i.e., RFDC) make sure plant capabilities satisfy the performance objectives of the FSFs via plant functions	Principal design criteria cover both adequate protection and reasonable assurance
Reasonable assurance (of adequate protection)	Reasonable assurance is provided by RIPB Special Treatments (e.g., Plant Programs)	
Additional design margins & Defense-in-Depth	Complementary Design Criteria (CDC) associated with NSRST SSCs	Prescriptive wording in GDC/ARDC (e.g., single failure criterion)
During which operating states are the design criteria relevant?	Licensing Basis Events (LBEs)	LBEs + Normal Operations

There is significant overlap between the GDC/ARDC and the RIPB PDC (+ CDC + Special Treatments); however, there are some “gaps” between the two

Topic 6 – Principal Design Criteria (PDC), cont.



- We believe that there is additional discussion to be had around the concept and definition of principal design criteria
- Definition of “principal design criteria” from Appendix A of 10 CFR Part 50
 - The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.
- The above definition complicates the incorporation into the LMP framework
 - “important to safety”
 - “testing”
- The TICAP team seeks NRC feedback and perspective on PDC in order to identify innovative ways to comply with the existing regulations while retaining the advantages of a risk-informed, performance-based methodology

Topic 6 – Principal Design Criteria (PDC), cont.

[Backup Slide 1/3]



- From LMP White Paper on SSC Classification – Section 2.4.1, Safety-Significant SSCs (<https://doi.org/10.2172/1700535>)
 - The term “important to safety” that is used in the NRC regulatory framework including the Advanced Reactor Design Criteria and General Design Criteria is not used within the LMP methodology. All the SSCs that have risk significance or perform functions necessary for DID adequacy are contained within the LMP safety-significant SSCs and are either SR SSCs or NSRST SSCs. There are no non-safety-significant SSCs within the LMP methodology that are judged to be “important to safety.” Hence it was deemed unnecessary to introduce an additional category called “important to safety” in order to formulate performance criteria for safety-significant SSCs.

Topic 6 – Principal Design Criteria (PDC), cont.

[Backup Slide 2/3]



- From NEI 18-04, Rev 1 – Section 3.2.3, Evolution of LBEs Through Design and Licensing Stages
 - The early stages of design development are guided by deterministic decisions that outline the desired safety characteristics for a given design. NRC Regulatory Guide 1.232, “Developing Principal Design Criteria for Non-Light Water Reactors,” should be used as one input by designers to initially establish principal design criteria for a facility based on the specifics of its unique design

Topic 6 – Principal Design Criteria (PDC), cont.

[Backup Slide 3/3]



- Section 4.1, SSC Safety Classification Approach for Advanced Non-LWRs
 - From Task 7: Determine SSC Specific Design Criteria and Special Treatment Requirements: For SSCs classified as SR, the design criteria are referred to as Safety-Related Design Criteria (SRDC). These are derived from the Required Functional Design Criteria (RFDC) that are in turn developed from the RSFs determined in the LBE selection process as discussed in Section 3 of this guidance. RSFs are those safety functions that must be fulfilled to keep the DBEs within the F-C Target. RFDCs are taken down to a lower level and form a transition to SSC-level criteria. RFDCs are defined to capture design-specific criteria that may be used to supplement or modify the applicable General Design Criteria or Advanced Reactor Design Criteria in the formulation of Principal Design Criteria. RSFs and RFDCs are technology- and design-specific and are framed at the function level. After SR SSCs have been selected to perform the RSFs, the SRDCs are defined at the SSC level in a manner that assures meeting the RFDCs and the RSFs for the specific SSC selected to perform the RSFs.

Topic 7 10 CFR 50.43(e) Testing



- TICAP agreed to consider guidance on 50.43(e) testing in light of the discussion during Workshop #1
- While TICAP agrees that first of a kind (FOAK) testing in general, and testing performed to meet 50.43(e) requirements in particular, supports the LMP-based safety case, the criteria governing the development of a testing program to meet 50.43(e) apply regardless of whether an application is based on the LMP
 - Accordingly, TICAP believes that any required detailed guidance for SAR documentation in this area should be developed by the NRC staff
 - However, TICAP proposes to modify its guidance as described on subsequent slides to provide general direction on including testing-related information in the SAR

Topic 7 10 CFR 50.43(e) Testing (cont.)



- Proposed Disposition
 - Guidance will be modified to indicate that FOAK testing related to the performance of SR SSCs should be addressed in Chapter 6 and testing related to NSRST SSCs should be addressed in Chapter 7
 - » This can include both performance/developmental tests and testing performed pursuant to 50.43(e)
 - Results of testing performed to address 50.43(e) requirements—i.e., data to develop/validate analytical models--should be described in Chapter 2

Topic 7 10 CFR 50.43(e) Testing (cont.)



- Cross-references between Chapter 2 and Chapter 6 and 7 (as appropriate) should be provided
- FOAK testing that cannot be performed until after fuel is loaded (e.g., requiring nuclear heat) should be discussed in startup/initial testing program
- Testing-related information in CP, OL, COL applications is expected only for the FOAK plant
 - » Subsequent plants can reference FOAK plant documentation
- Testing-related information in DC applications is included in DC FSAR

Topic 22 – Observations from eVinci and MCRE Tabletop Exercises



- *The staff has provided industry with a list of NRC observations from the TICAP tabletop exercises. To date, industry's feedback on these observations has been limited to the first two TICAP tabletop exercise observations. The NRC staff would be interested in industry's feedback on the NRC observations for the last two TICAP tabletop exercises (i.e., the eVinci microreactor, and the molten chloride reactor experiment (MCRE)). In particular, the NRC staff would be interested in whether industry identifies potential workshop items from eVinci and MCRE TICAP tabletop exercises that are not captured in the items identified above.*
- TICAP Discussion
 - TICAP has identified no additional items for workshop discussion that are not already on the table

Topic 20 – Draft NRC ISG and Reg Guide



- *Around Workshop #3, the staff is considering discussion of a draft TICAP RG and an ARCAP roadmap ISG to start the discussion on how industry's guidance is envisioned to fit within TICAP and the staff's initial thinking on where industry's TICAP guidance is envisioned to be supplemented (e.g., fuel qualification, ASME Section III Division 5, design review guide for I&C)*
- TICAP Discussion
 - The NRC recently issued two draft documents related to TICAP
 - » Draft ISG on the review of advanced reactor applications
 - » Draft Regulatory Guide on the TICAP guidance document
- TICAP has not performed a detailed review of either but offers some feedback in these slides

Topic 20 – Draft NRC ISG and Reg Guide (cont.)



- General
 - TICAP understands the role of the two documents
 - The documents should provide useful guidance for advanced reactor applicants following the NEI 18-04 methodology and using the TICAP guidance document
 - Some specific observations on each document follow

Topic 20 – Draft NRC ISG and Reg Guide (cont.)

Draft ISG



- P. 8: Titles of Chapters 2 and 3 differ somewhat from the April 15 draft TICAP guidance document
 - Chapter 2: “Generic Analyses” (ISG) vs. “Methodologies and Analyses” (TICAP)
 - » Depending of ultimate material included in Chapter 2, further title adjustment may be warranted
 - Chapter 3: “Licensing Basis Event Analyses” (ISG) vs. “Licensing Basis Events” (TICAP)
- It would be useful for the NRC to go ahead and identify additional information to be included in Chapters 1-8 beyond information addressed by TICAP
 - For example, site information in Chapter 2

Topic 20 – Draft NRC ISG and Reg Guide (cont.)

Draft Reg Guide



- P. 8: As with the draft ISG, there is a chapter title mismatch between TICAP and the draft Reg Guide (see ISG comment)
- P. 12, 3rd Regulatory Position, part a: TICAP questions requiring non-light water reactor (LWR) advanced reactors to address Generic Safety Issues, Unresolved Safety Issues and Three Mile Island action items
 - Also, it is outside TICAP scope
- P. 12, 3rd Regulatory Position, part b: Does “any proposed exceptions” refer to parts of Reg Guides that are otherwise considered applicable to the non-LWR advanced reactor design?
- P. 12, 3rd Regulatory Position, part c: TICAP already provides for identification of codes and standards in a summary table (Section 1.4.4) and in the appropriate parts of Chapters 6 and 7
 - This need for this part of the regulatory position is not clear

Topic 20 – Draft NRC ISG and Reg Guide (cont.)

Draft Reg Guide



- PP. 12-13, 6th Regulatory Position
 - Items (a) and (b) do not reflect the wording of the April 15 draft TICAP guidance document draft
 - Item (c) appears to be at least somewhat duplicative of information in Chapters 6 and 7
- PP 16-17, 11th Regulatory Position: TICAP does not see the need for this position on fuel qualification
 - The details of the fuel qualification plan and fuel qualification activities are not necessary for inclusion in the SAR
 - It is anticipated that the results of fuel qualification work that form the basis for the performance of that safety-related component will be included in Chapter 6 or incorporated by reference
 - Fuel qualification is expected to impact the source term as well (Chapter 2)

Topic 20 – Draft NRC ISG and Reg Guide (cont.)

Draft Reg Guide



- PP 18-20, 17th Regulatory Position: TICAP does not understand the desire to incorporate special treatment information by SSC in Chapter 8
 - SR SSC special treatment information is in Section 6.2
 - NSRST SSC special treatment information is in Section 7.1

Topic 20 – Draft NRC ISG and Reg Guide (cont.)

Draft Reg Guide



- Appendix A – Construction Permit (CP) Application Guidance
 - TICAP plans to review the draft Appendix A and incorporate material into the TICAP guidance as appropriate
 - Unlike the body of the draft reg guide, the information currently in Appendix A appears to be written for staff reviewers, not for applicants
- CP guidance – general
 - TICAP embedded its CP guidance into the main body of the guidance
 - NRC used a separate appendix for its guidance
 - Should there be a consistent approach?
 - » It would seem that NRC material should follow the TICAP organization rather than being in a separate appendix



Advanced Reactors

Overview of ARCAP Roadmap ISG and TICAP DG White Papers

[ADAMS Accession No. ML21134A164](#)



Advanced Reactor Content of Application (ARCAP)

To ensure review readiness to regulate a new generation of advanced reactors, a key element of a flexible regulatory framework is to provide guidance for the development of content of an advanced reactor application.





ARCAP

Background



Purpose

Provides a roadmap for developing a tech-inclusive, risk-informed application. Leverages existing guidance or guidance that is under development.



Broad

Encompasses industry-led technology-inclusive content of application project (TICAP).



Need for Additional Guidance

Roadmap also identifies areas where additional guidance is needed (i.e.: Technical Specifications).



Regulatory Applicability (As applicable)

10 CFR Parts 50, 52, and informs 53.



Streamlined Review Process

ARCAP guidance document not intended to replicate NUREG-0800, “Standard Review Plan for LWRs.”



Previous Discussions

ARCAP overview discussed at August 2020, October 2020, and February 2021 public meetings.

ARCAP Roadmap ISG – **Outline**



Identifies all
Adv. Rx
application
topics.



Provides
background and
overview of
expected
information for each
topic.



Provides
endorsements,
clarifications,
supplements info, or
points of emphasis.



Provides pointers to
key guidance in
support of
application topic.

TICAP

Background



Purpose

- TICAP is industry-led guidance focused on describing the scope and level of detail for portions of an application consistent with the LMP.
- LMP is described in NEI18-04, as endorsed by RG 1.233
- Industry-led TICAP guidance only applicable to portions of first 8 SAR chapters.
- Aims to minimize burden of generating and supplying non-safety significant information.



Regulatory Applicability (As applicable)

10 CFR Parts 50, 52, and informs 53



Methodology

Scope is governed by the LMP-based safety case. LMP process is one approach to select licensing basis events, develop SSC categorization and ensures defense-in-depth is considered

TICAP draft DG– **Outline**



Endorses
LMP-based
NEI 21-xx
TICAP
document.



Provides additional
clarifications, exceptions,
points of emphasis from
information described in
NEI 21-xx.



Provides further
information needed
outside of LMP-based
affirmative safety case
for first 8 chapters.



Includes appendices
to key guidance in
support of FSAR
development for first
8 chapters.

ARCAP and TICAP – Nexus

Outline Safety Analysis Report (SAR) – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview of the Safety Case
2. Generic Analyses
3. Licensing Basis Event (LBE) Analysis
4. Integrated Plant Analysis
5. Safety Functions, Design Criteria, and SSC Categorization
6. Safety Related SSC Criteria and Capabilities
7. Non-safety related with special treatment SSC Criteria and Capabilities
8. Plant Programs

Additional SAR Content –Outside the Scope of TICAP

9. Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste
10. Control of Occupational Doses
11. Organization
12. Initial Startup Programs

Additional Portions of Application

- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- PRA
- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Physical Security Plan
- SNM physical protection program
- SNM material control and accounting plan
- Cyber Security Plan
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Inservice inspection/Inservice testing (ISI/IST) Program
- Environmental Report
- Site Redress Plan
- Exemptions, Departures, and Variances
- Facility Safety Program (under consideration for Part 53 applications)

Audit/inspection of Applicant Records

- Calculations
- Analyses
- P&IDs
- System Descriptions
- Design Drawings
- Design Specs
- Procurement Specs

- Safety Analysis Report (SAR) structure based on clean sheet approach

NRC ARCAP/TICAP Guidance

Other Insights



Efficiency

NRC ARCAP/TICAP guidance being developed in parallel to industry,

1

Openness

Main purpose of releasing draft documents is to solicit stakeholder feedback on proposal,

2

Initial Thoughts

The guidance structure, not detailed content, is the focus of stakeholder interactions,

3

Adaptable

ARCAP guidance includes placeholders for guidance under development (i.e.: Pre-app engagement, Applicability of Regs),

4

Endorsement

NRC TICAP white paper endorses, as appropriate, industry's TICAP document,

5

Supplements

NRC TICAP white paper supplements, as appropriate, information not addressed in industry's TICAP document (i.e.: Fuel Qual and ASME Sec III, Div 5).

6

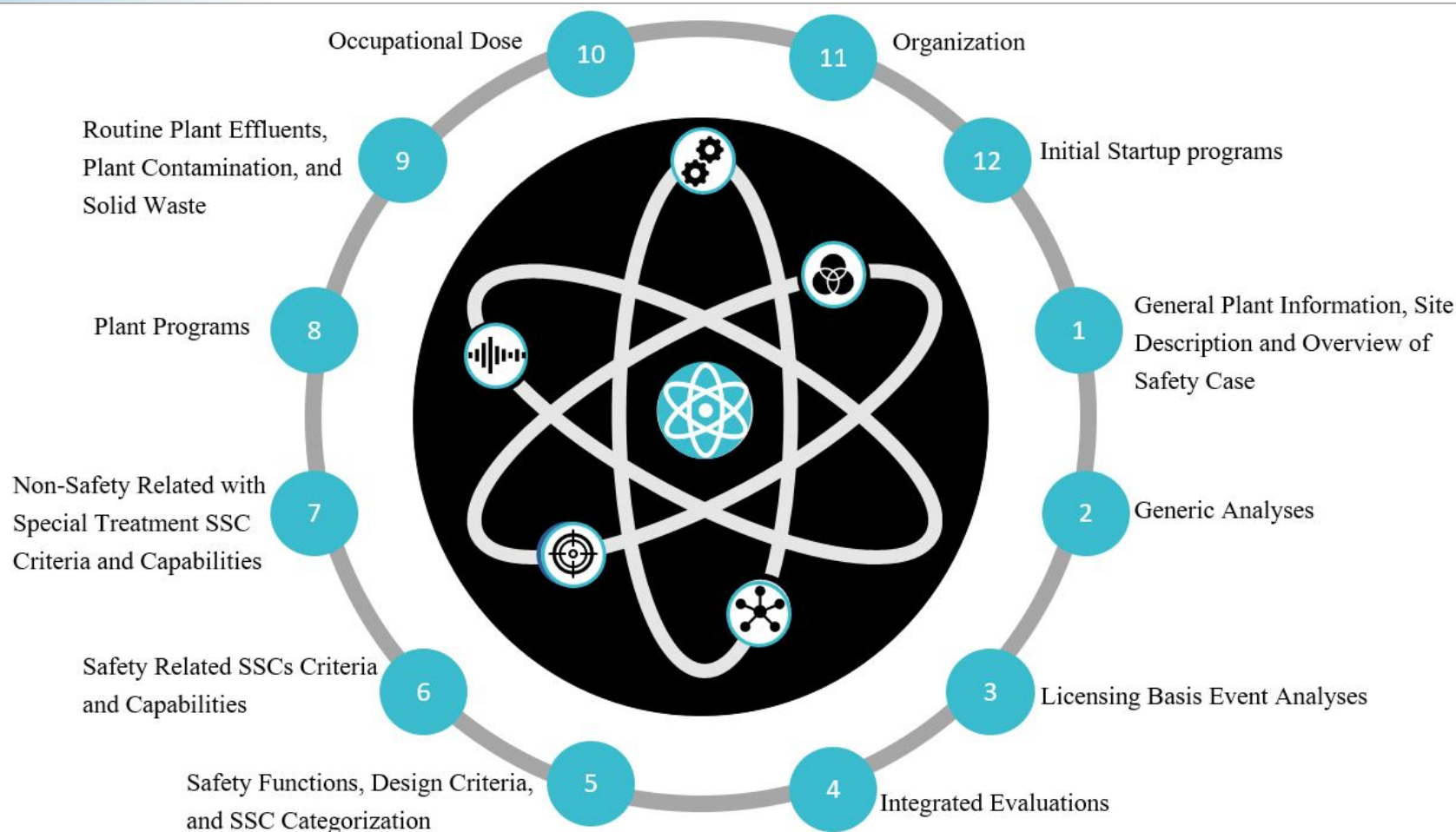
ARCAP Roadmap ISG – **Example 1**

- FSAR structure developed as a result of extensive stakeholder engagement.
- Consists of 12 main chapters.
- Provides the most safety-significant information at the forefront (ASC).
- Focus on the most relevant safety information while removing unnecessary details.
- Additional information/background is available for audit/inspection by NRC.

Contents of an Advanced Reactor Application*

- **Safety Analysis Report**
- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (Design, Construction, and Operation)
- Fire Protection Program (Design and Operation)
- Probabilistic Risk Assessment
- Environmental Report/Redress Plan
- Emergency Plan
- Physical Security Plan
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Special Nuclear MC&A
- ITAAC
- Cyber Security Plan
- ISI/IST
- Financial Qualification/Liability
- Facility Safety Program

*Contents of application are still under discussion. List represents a draft outline



Note: SAR Chapters 1-8 addressed by TICAP. SAR Chapters 9-12 addressed by ARCAP.



Ch. 1 - General Plant Information, site description, and overview of safety case (TICAP)

Information should provide an understanding of the overall facility (type of application, the number of plant units, a brief description of the proposed plant location, and the type of advanced reactor being proposed). The site description should provide an overview of the actual physical, environmental and demographic features of a site, and how they relate to the affirmative safety case.

Clarifies

- Roadmap clarifies that guidance applicable to chapter 1 is described in NEI 21-xx – TICAP document.

Endorses

- RG 1.2xx “Guidance For A Technology-inclusive Content Of Application Methodology To Inform The Licensing Basis And Content Of Applications For Licenses, Certifications, And Approvals For Advanced Reactors.”

Key Guidance

- Chapter 1 of NEI 21-xx (TICAP) as one acceptable method.

Supplements

- Construction Permit Information in NEI 21-xx by including Appendix A for info outside LMP for first 8 chapters.*



Ch. 2- Generic Analyses (TICAP)

Certain analyses are common to several licensing-basis event analyses. Information should describe the process and methods used to develop baseline information related to the probabilistic risk assessment (overview of the PRA), source-term analysis, and design-basis accidents (DBAs) analytical methods.

Clarifies

- Roadmap clarifies that guidance applicable to chapter 2 is described in NEI 21-xx – TICAP document.

Endorses

- RG 1.2xx “Guidance For A Technology-inclusive Content Of Application Methodology To Inform The Licensing Basis And Content Of Applications For Licenses, Certifications, And Approvals For Advanced Reactors.”

Key Guidance

- Chapter 2 of NEI 21-xx (TICAP) as one acceptable method.

Supplements

- “Site Information” draft ISG previously released.
- Staff positions on additional considerations to document information.



Ch. 10 – Control of Occupational Dose

Information should include facility and equipment design, radiation sources, and operational programs that are necessary to ensure that the occupational radiation protection standards set forth in 10 CFR Part 20 are met. The information should also include any commitments made by the applicant to develop the management policy and organizational structure necessary to ensure occupational radiation exposures are as low as (is) reasonably achievable (ALARA).

Clarifies

- Guidance is included for chapters 9-12.

Endorses

- DANU-ISG-2021-XX, “Control of Occupational Dose.”
- Released on prior ARCAP/TICAP public meeting.

Key Guidance

- RG 8.8
- RG 8.10
- ANSI/ANS 18.1-1999
- NEI 07-08A
- Draft list released in prior public meeting. Expected to evolve. (MLxyz123).

Supplements

ARCAP Roadmap ISG – **Example 2**

- Ongoing “Emergency Preparedness Requirements for Small Modular Reactors and Other New Technologies” rulemaking.
- Rule would amend the NRC’s regulations to add new emergency preparedness requirements for small modular reactors, non-light-water reactors and non-power production or utilization facilities.
- Rule would adopt a scalable plume exposure pathway emergency planning zone approach that is performance-based, consequence-oriented, and technology-inclusive.

Contents of an Advanced Reactor Application*

- Safety Analysis Report
- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (Design, Construction, and Operation)
- Fire Protection Program (Design and Operation)
- Probabilistic Risk Assessment
- Environmental Report/Redress Plan
- **Emergency Plan**
- Physical Security Plan
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Special Nuclear MC&A
- ITAAC
- Cyber Security Plan
- ISI/IST
- Financial Qualification/Liability
- Facility Safety Program

*Contents of application are still under discussion. List represents a draft outline



Emergency Preparedness Plan

This rulemaking would develop a dose-based, consequence-oriented framework for future SMR applicants and licensees with respect to offsite EP that would reduce the need for exemptions related to regulations associated with large LWRs.

- SECY-16-0069 (ML21007A330)

Clarifies

Endorses

Key Guidance

Supplements

- Ongoing rulemaking.
- DG-1357, “Emergency Response Planning and Preparedness for Nuclear Power Reactors.”
- SECY-18-0103

Key Messages

What's Next?

- Draft roadmap ISG released as white-paper to solicit stakeholder feedback. Further iterations expected.
- Some sections are primarily aligned with the Licensing Modernization Project (LMP), however:
 - the concepts and general information may be used to inform the review of an application submitted using other methodologies (as applicable) such as a maximum hypothetical accident, or deterministic approaches.
- Draft ISG expected to be released Fall 2021.



Next Steps – Future Milestones

TICAP Near-Term Milestones

Early June 2021

(NRC staff comments on draft guidance document provided to industry)

Late July 2021

(Industry revised guidance provided to the NRC)